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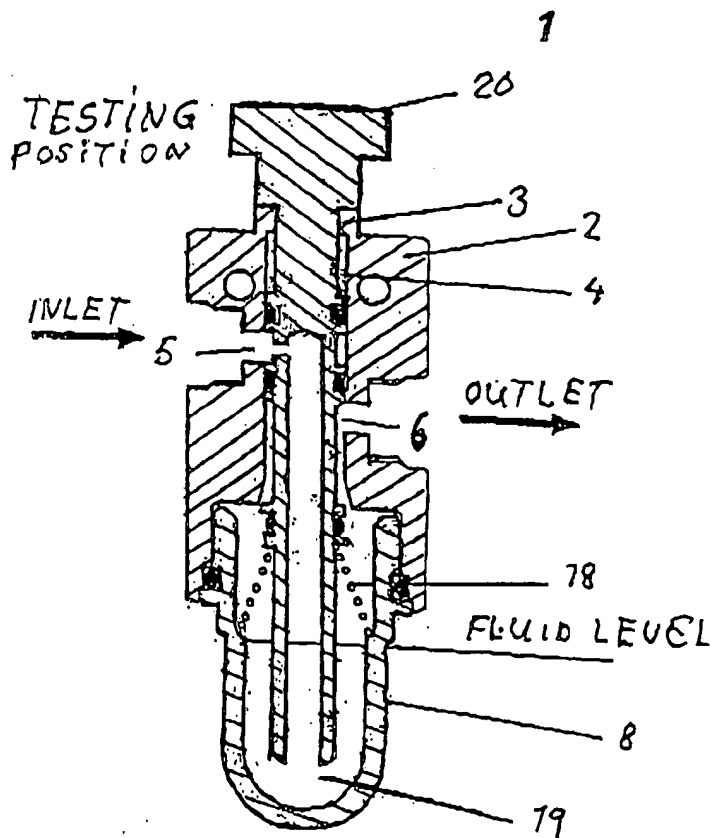
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[Continued on next page]

(54) Title: DEVICE FOR DETERMINING EFFECTS SUFFERED BY A FLOW-CONTROLLED GASEOUS MEDIUM



(57) Abstract: Liquefied petroleum gas is widely used in leisure time activities. Here, as liquefied petroleum gas is highly inflammable, it is important to have an indicator (19) that quickly determines whether there is leakage. The present invention relates to a new leak indicator (19) that, when an easily operated button (20) is pushed downwards into a cavity (8), indicates whether or not there is leakage. The space confined in the cavity (8) is completely closed off when the appertaining liquefied petroleum gas system is in normal operation mode.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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## DEVICE FOR DETERMINING EFFECTS SUFFERED BY A FLOW-CONTROLLED GASEOUS MEDIUM

The present invention is based on a device for determining the effects suffered by a flow-controlled gaseous medium. An explanatory instance of this is a gaseous medium carried in pipes from a supply point to various consumption points. At these latter points, there is usually a desire to check that the medium has not suffered any undesirable effects. The flow may have been affected by leakage, in which case, air bubbles will have become trapped in the medium. This can be determined by having the medium flow through a fluid, which will disclose the presence of air bubbles. The gaseous medium may also have picked up undesirable substances. Once again, the medium can be passed through an indicator, such as a fluid, that will, for example, change colour if undesirable substances are present. There are many possible variations. The most suitable way of determining whether a gaseous medium has suffered an undesirable effect is to have the controlled flow pass through a device where, by switching from operation mode to test mode, it can be determined whether the medium has been exposed to extraneous influences.

There are already such devices on the market but, as is not uncommon, these have certain disadvantages.

The present invention is designed to present a new device that has taken into account the disadvantages of the already available devices. In one known device to determine any effects, a control (actuator) can be switched between two positions. In one of these positions, the gaseous medium passes directly through the device. In the other, it passes through an indicator, which may be a fluid. When it is necessary to carry out a test, said actuator must be moved upwards. This is a manoeuvre that, in a crisis situation, works poorly and feels unnatural for any user in such a situation. Thus, in the present invention, the actuator has been so arranged that, when it is desired to obtain information regarding leakage, the actuator is pressed downwards. This is the most natural reaction of users in crisis situations. A unit with a device as

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per the present invention can be located in an object that can be subject to various forms of movement. In such cases, it must not be possible for the indicator to leave I confines to permit the through-flow of the gaseous medium. The invention is so constructed that, in normal operating mode, the indicator is completely closed off from  
5 the through-flow of the gaseous medium.

The invention is characterised by a housing that has a cylindrical cavity in which a cylindrical flow control body can move between an upper and a lower position. Between the inner surface of the housing that provides the cavity and the outer  
10 surface of the control body, there are three seals. These seals are fixed to, and spaced along, the outer surface of the flow control body and are in contact with the inner surface of the housing that provides the cavity. They are so placed that, in an upper position, direct free passage is provided for the gaseous medium to flow through the device while, at the same time, the compartment holding the indicator is  
15 completely closed off. In the other position (a position for testing) i.e. when the cylindrical body is in its lower position, the gaseous medium's direct free passage through the device is blocked while the flow control body creates an alternative route by opening the indicator and the lowest seal for free passage. Thus, with the flow control body in its upper position, the indicator compartment is completely closed off  
20 and the gaseous medium can only flow directly through the device. However, with the flow control body in its depressed position, the gaseous medium is forced to flow through the indicator before exiting the device.

Other characteristics of the present invention are disclosed in the following patent  
25 claims.

One design of the present invention is described in the explanation of the attached drawing, where:

30 Fig. 1 shows the device where it only permits direct free passage of a gaseous medium, and

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Fig 2 shows the device set so that the gaseous medium passes through an indicator before exiting the device.

The figures show a device that, in the operating mode, permits the direct passage of a gaseous medium without said medium being subjected to any extraneous influences whatsoever. The device can also be activated so that the gaseous medium has to pass through an indicator that has the function of determining whether said medium has been exposed to any extraneous influences, e.g. leakage. Thus, a device as per both figures is used by connecting it into a conduit through which there is a flow of a gaseous medium. Connection is achieved by making a break in the conduit and connecting the ends via the inlet and the outlet of the device.

The device shown in both figures is intended for connection into a pipe forming part of a liquefied petroleum gas (LPG) system. Of course, the device is not restricted to use in LPG systems. It can be used in all cases where it is sought to determine whether a gaseous medium has suffered any effects.

The figures show the device adapted for an LPG system and serving as a leak indicator. The leak indicator is labelled 1 and comprises a housing (2) with a cylindrical flow control body (3) that can be moved upwards and downwards in a cylindrical cavity (4) in the housing (2). As the diameter of the cylindrical flow control body (3) is less than that of the cavity (4), a ring-shaped cylindrical (tubular) void is left between the cylindrical flow control body (3) and the cavity (4). This void connects to an inlet (5) for a gaseous medium that is intended to flow through the housing (2) and exit it via an outlet opening (6). In figure 1, part of said tubular void is labelled 7 and it can be seen how the gaseous medium flows through the tubular void (7) and then exits the housing (2) through the outlet (6). Spaced along its outer surface, the cylindrical flow control body (3) has three seals (15 - 17). In figure 1, seals 16 and 17 delimit the gas flow through the indicator (1). At its lower end, housing 2 has a further housing (8) for a fluid or other indicator medium. Housing 8 is joined to housing 2 via a fastening device (9). The cylindrical flow control body (3) encloses its own

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cylindrical cavity (13). This cavity is axially disposed, closed at its top but open at the lower end of the cylindrical flow control body (3). The open end is labelled 14.

Towards its upper end, cylindrical cavity 13 has an opening (12) located between seals 15 and 16. This opening provides a direct connection to the void around the  
5 cylindrical flow control body (3). All three seals (15 – 17) are firmly fixed to the flow control body (3). Housing 2 has a spring (18) that, at one end, rests on seal 17 and, at the other, against a part of the housing. Through the action of this spring (18), the cylindrical flow control body (3) automatically takes up its top position. Thus, when a test reading is required, the actuator (20) must be manually pressed down. As soon  
10 as the downwards pressure is removed, the cylindrical flow control body (3) returns to its original (home) position.

In the above manner, the present invention serves as a leak indicator. When the leak indicator's actuator is pressed down, an indication is given of whether there is or is  
15 not a gas leak. That the leak indicator's actuator always takes up its topmost position in the absence of external pressure is a valuable safety feature. Owing to the design of the invention, indicator fluid can never flow into the passage for the direct through-flow of the gas, even when the invention is not in what would be considered its normal position.

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## PATENT CLAIMS

1. Device (1) to determine if a flow-controlled gaseous medium has suffered any effects, the device, in the normal operating position, allowing the medium free and direct through-passage and, in the testing position, allowing the medium to pass through an Indicator (19), e.g. a fluid, that indicates the type of influence to which the medium has been exposed. Said device (1) comprises a housing (2) with a flow control body (3) that can move between two positions, the medium being able to flow directly through the device (1) with said body in one of its positions and being forced to flow through the Indicator with said body in its other position, the whole being characterised by the housing (2) and flow control body (3) being so designed that, with the latter in one of its positions (the upper position), the medium flows directly through the device (1) while, contemporaneously, the indicator (19) is closed off from the device's direct channel (5 – 7) for the medium and, with the flow control body (3) in its other position (the lower position), said channel (5 – 7) being broken and replaced by a channel (13) through the indicator.
2. Device as per patent claim 1, characterised by the flow control body (3) constantly taking up a home position (the upper position) owing to the action of a spring (18).
3. Device as per patent claim 1, characterised by the flow control body (3) being cylindrical and mobile within a cylindrical cavity (4) in the housing (2) and, additionally, by the flow control body (3) having three seals (15 – 17) spaced along it and projecting from the body (3) to the perimeter of the cavity (4), the lower seal (17) and the middle seal (16) working together to form a direct through-flow channel (5 – 7) and the lower seal (17) completely closing off the Indicator (19) from said direct through-flow channel (5 – 7).



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4. Device as per patent claim 2,  
characterised by the flow control body (3) itself having a cavity (13) that, at the  
body's lower end, is completely open, there also being an opening (12) at the  
upper end of the cavity (13), said opening, when the flow control body (3) is in its  
lower position, connecting to the direct through-flow channel (5 – 7).
5. Device as per patent claim 1,  
characterised by the indicator (19) being a fluid such as propylene glycol in a  
compartment/housing (8) that, preferably, is transparent.
6. Device as per one or more of the preceding patent claims,  
characterised by the device being connected into a system for the use of liquefied  
petroleum gas, the connection being made in such a way that the device is  
capable of determining whether there is leakage.

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## AMENDED CLAIMS

[Received by the International Bureau on 21 July 2004 (21.07.04) ;  
original claims 1-5 replaced by amended claims 1-6 (2 page)]

## PATENT CLAIMS

1. Device (1) to determine if a flow-controlled gaseous medium has suffered any effects, the device, in the normal operating position, allowing the medium free and direct through-passage and, in the testing position, allowing the medium to pass through an indicator (19), e.g. a fluid, that indicates the type of influence to which the medium has been exposed. Said device (1) comprises a housing (2) with a flow control body (3) that can move between two positions, the medium being able to flow directly through the device (1) with said body in one of its positions and being forced to flow through the indicator (19) with said body in its other position, the housing (2) and flow control body (3) being so designed that, with the latter in one of its positions (the upper position), the medium flows directly through the device (1) while, contemporaneously, the indicator (19) is closed off from the device's direct channel (5 – 7) for the medium and, with the flow control body (3) in its other position (the lower position), said channel (5 – 7) being broken and replaced by a channel (13) through the indicator, the whole being characterised by the flow control body (3) being cylindrical and mobile within a cylindrical cavity (4) in the housing (2) and, additionally, by the flow control body (3) having three seals (15 – 17) spaced along it and projecting from the body (3) to the perimeter of the cavity (4), the lower seal (17) and the middle seal (16) working together to form a direct through-flow channel (5 – 7) and the lower seal (17) completely closing off the indicator (19) from said direct through-flow channel (5 – 7).
2. Device as per patent claim 1, characterised by the flow control body (3) itself having a cavity (13) that, at the body's lower end, is completely open, there also being an opening (12) at the upper end of the cavity (13), said opening, when the flow control body (3) is in its lower position, forming a through-flow channel (5 – 13 – 7).
3. Device as per patent claim 1, characterised by the indicator (19) being a fluid such as propylene glycol in a compartment/housing (8) that, preferably, is transparent.

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4. Device as per one or more of the preceding patent claims, characterised by the device being connected into a system for the use of liquefied petroleum gas, the connection being made in such a way that the device is capable of determining whether there is leakage.

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5. Device as per patent claim 1, characterised by the flow control body (3) constantly taking up a home position (the upper position) owing to the action of a spring (18).

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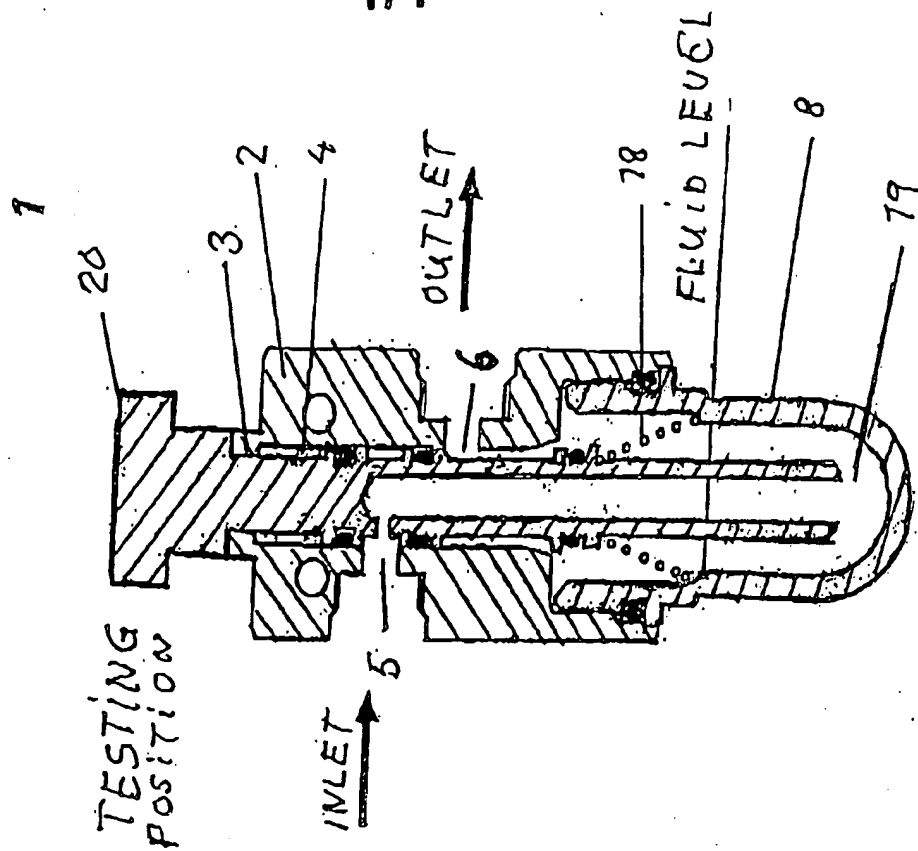
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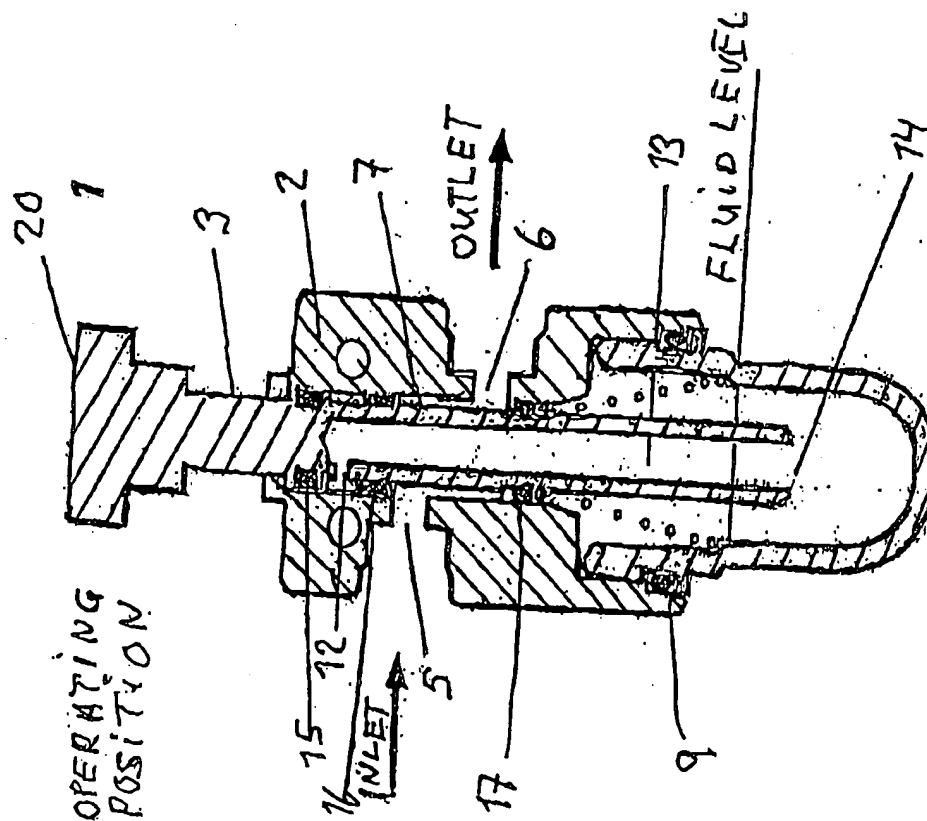
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Figur 2



Figur 1



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 2004/000464

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G01M 3/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4077427 A (ROSAN, JR, J ET ALX), 7 March 1978 (07.03.1978), whole document --	1-6
X	US 3583435 A (STEWART, B D), 8 June 1971 (08.06.1971), whole document --	1-6
A	US 1959863 A (GRISS, F G), 22 May 1934 (22.05.1934), figures 1,2 --	1-6
A	US 4068522 A (POE, L R), 17 January 1978 (17.01.1978), abstract -- -----	1-6

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

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- "E" earlier application or patent but published on or after the international filing date
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- "O" document referring to an oral disclosure, rec. exhibition or other means
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

30/04/2004

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